House of Lords Committee on Risk Assessment and Risk Planning

BioRISC submission on improving risk assessment and planning

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This evidence is submitted as individuals who work within the BioRISC programme rather than representative of the university or college.
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1. BioRISC, Biosecurity Research Initiative at St Catharine's, was established in 2019 thanks to the generosity of The David and Claudia Harding Foundation, with the objective of exploring ways of linking science and policy, especially in biosecurity. It works closely with The Centre for the Study of Existential Risk (who are making an independent submission), The Conservation Evidence Team in the Department of Zoology, University of Cambridge and The Invasive Species Group in the Department of Zoology, University of Cambridge.

2. Our suggestions aim to improve practice and reduce vulnerability, rather than raise points for specific risks. This approach underpins many of the questions listed, but applies especially to four questions: (3) How could the Government's approach to risk assessment be strengthened to ensure that it is rigorous, wide-ranging and consistent? (5) How can the Government ensure that it identifies and considers as wide a range of risks as possible? (10) What challenges are there in developing resilience capability? (11) What challenges are there in developing resilience capability?

3. Our core concern is that the elements underpinning policy making tend to be reactive to events rather than be anticipatory and as a result policy-making is less timely, effective and efficient. We have created a set of processes that we believe substantially improve risk assessment and planning; we have used these for our BioRISC work on biosecurity and more broadly. In this submission we consider five stages.

Horizon scanning of potential issues.

4. The sheer breadth of issues facing policy-makers can make prioritisation difficult. Horizon scanning is the process of identifying trends and phenomena that might gain prominence but are not yet widely known or understood. Some of these may well be neutral or positive, but many may lead to otherwise unforeseen risks and so monitoring the landscape is crucial. We have run horizon scans on a wide range of subjects (26 so far), which can be broad - such as our horizon scans on conservation (Sutherland 2021) or bioengineering (Kemp *et al.* 2020, Wintle 2017) - or narrow - such as invasive species (Ricciardi et al 2016). It is extremely valuable to repeat these scans on a regular basis to ensure continuous monitoring of emerging issues: we have been running annual horizon scans on conservation issues since 2010.
5. Our approach is to convene experts from a wide range of organizations and ask each to identify issues from their colleagues and associates, typically involving a few hundred contacts. The experts usually then use a modified version of the Delphi Technique (a form of structured expert elicitation that involves a group of experts systematically reaching an informed consensus and prioritisation) to reduce this to a short-list. Depending on the horizon selected, such scans can be used to identify novel issues (e.g. annual conservation horizon scan; invasive species Ricciardi et al., 2017), under-considered issues (e.g. forest-linked livelihoods Oldenkop et al 2020 or challenges to UK government Parker 2014) all challenges in a topic area, whether well-known or novel (e.g. shorebirds Sutherland et al 2012) or assessing the relative risk of a list of likely options.
6. One attempt has tested this approach's effectiveness. Ten years after our first annual horizon scan on conservation issues we reviewed the 15 topics identified. Five, including microplastic pollution, synthetic meat, and environmental applications of mobile-sensing technology, appeared to have had widespread salience and effects. The effects of six topics were moderate, three had not emerged, and the effects of one topic were low (Sutherland 2019).
7. Horizon scanning is often used to identify the consequences of societal changes. We suggest that horizon scanning to identify unrecognised, long-term and emerging risks be adopted across the major areas of societal risk.

8. **Recommendation 1: A programme of routine horizon scanning be established across the major areas of societal risk to anticipate future challenges and options. The government could commission these studies to the area of POST in charge of Horizon scanning (https://post.parliament.uk/type/horizon-scanning) or to academics or research institutes.**

Identifying research needs for risk.

9. Fifteen years ago we created a process by which decision makers and researchers can work together to identify the questions that, if answered, would make most difference for the future of research and government. In Kemp et al (2021) for example, we identify 80

questions that, if answered, would have the largest positive impact on UK biosecurity. This process of creating research agendas is a promising way to identify what is needed to address societal challenges and risks, and can thus usefully inform policy and government strategies. We have conducted 23 such rigorous and democratic exercises, including on habitat restoration (Ockendon 2018) invasive species (Ricciardi et al., 2016), sustainability (Green 2016), Antarctic science (Kennicutt 2015) and UK poverty reduction (Sutherland 2013).

10. An analysis (Jucker et al 2018) of the outputs of an exercise (Sutherland 2009) a decade earlier showed that as of July 2016 the paper had been cited 229 times, 70 of which did so specifically to justify research on topics highlighted in the paper They also identified 21 questions that met their criteria for knowledge gaps and so needed further work. This shows such exercises are used to generate research and can be used to record progress.
11. Our experience is that this process needs to combine the strengths of practitioners, who know which knowledge gaps are important, and researchers, who can convert general interests into specific research questions. Attention needs to be paid to the composition of the expert group to include varied backgrounds, perspectives and experience: This is not an exercise to amplify already established prominent voices. The methodology of such scans must also be carefully considered to avoid potential bias within the process.
12. This process sets a strategic research agenda for government and for the future of academic research. It can help better align academic research and policy-maker needs..

13. **Recommendation 2: For the main areas of societal risk we have created a process ("Question Prioritisation) for identifying the research questions of highest importance; we advise its use to improve our knowledge of unknown and emerging risks.**

Solution scanning

14. This is a key policy tool used by our team in which a database of possible management interventions is compiled by a wide group of experts. This solutions database provides the basis for subsequent research, evidence reviews or policy making.
15. Our research (Walsh et al 2014) has shown for one area of practice that relevant practitioners were only aware of 51% of possible solutions; our experience is that this is routinely true. We suggest the process of solution scanning as an initial stage. For Covid-19, in March 2020, the BioRISC team, along with researchers from Conservation Evidence and from 13 other institutions, carried out a 'solution scan' to identify potential options to reduce spread of COVID-19 while allowing for some degree of societal normality. The subsequent preprint (Sutherland *et al.* 2020) generated widespread interest and was covered by >70 media outlets from >10 countries. The article was also used by policy makers in governments. Following the success of this BioRISC brought together an international team of wildlife trade and animal disease researchers and launched a major review and solutions scan of possible pathways of zoonotic epidemics. They

determined that there were seven main routes by which pandemics might arise in the future and identified possible ways to reduce the risk of four of these pathways (Petrovan *et al.* 2020). They did not consider routes outside their expertise, such as laboratory accidents, intentional release or antimicrobial resistance, but recommend that solution scans be carried out for these areas.

16. We stress throughout that the outputs are not recommendations per se but a means of expanding the list of possible options when considering subjects for further research, review or adoption.
17. **Recommendation 3: For areas of policy importance solution scanning be used to ensure that a full range of options are considered**. We recommend that it becomes a routine part of decision making in all risk policy areas.

Automating the collation of evidence with Evidence Synthesis methods

18. A major aspect of our research is in devising new means of collating and synthesizing evidence. The standard synthesis method, which has been so successful in medicine, is to review the effectiveness of different interventions in giving the desired response.
19. One problem is that this works less well for subjects where the literature is limited and/or diffuse. One solution is the approach of subject-wide evidence synthesis (Sutherland et al 2020) in which entire fields are reviewed at one time, such as wetland or farmland management for conservation (see www.conservationevidence.com).
20. Evidence synthesis can be performed using a set of methods to systematically collect and summarize knowledge. These include rapid evidence assessments, summaries of scientific studies, systematic reviews with meta-analysis, and expert consultation.
21. We believe it would be useful to collate all the evidence on other topics, such as laboratory safety or all the studies on human behaviour change relating to societal threats and hazards.
22. We also believe that taking pro-active rather than reactive approach to the collation of evidence is key. When this is done, evidence can immediately be consulted by policy-makers rather than requiring new evidence assessments that may be relatively slow to collate, resulting in decision-making that is not informed by evidence.
23. **Recommendation 4: Evidence is collated across areas of risk using subject-wide evidence synthesis.**

Fault trees.

24. Fault Tree Analyses are used when assessing complex systems because they identify logical relationships between particular system failures and all their contributing causes.
25. An example is where fault trees have been used in the design of power stations to consider where they are most likely to fail. We have used for them for considering the routes by which invasive species could become problematic in the UK and identified key

points at which mitigations would have the greatest impact. This showed that pre-border management reduced the overall risk of invasion by 86%, and that early action after introduction reduced invasion risk by 85%. In contrast, post-establishment interventions, such as eradication and containment, had a limited impact on the probability of widespread invasion (only 18-24% reduction in risk).

26. **Recommendation 5: Fault tree analysis be routinely used to identify the most vulnerable stages in risk pathways, and to understand the most effective way to deploy resources in the management of hazards and threats.**

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